

WE CLAIM:

1 1. A positioning device for precisely positioning a microtiter plate on a
2 support, wherein the positioning device comprises at least a first alignment member that is
3 positioned to contact an inner wall of the microtiter plate when the microtiter plate is in a
4 desired position on the support.

1 2. The positioning device of claim 1, wherein two or more alignment
2 members are positioned to contact a single inner wall of the microtiter plate when the
3 microtiter plate is in the desired position on the support.

1 3. The positioning device of claim 1, wherein the positioning device further
2 comprises at least a second alignment member that is positioned to contact a second wall of
3 the microtiter plate when the microtiter plate is in the desired position on the support.

1 4. The positioning device of claim 3, wherein the second wall of the
2 microtiter plate is an inner wall.

1 5. The positioning device of claim 4, wherein the first inner wall and the
2 second inner wall form a right angle.

1 6. The positioning device of claim 4, wherein two or more alignment
2 members are positioned to contact the first inner wall of the microtiter plate, and at least a
3 third alignment member is positioned to contact the second inner wall, when the microtiter
4 plate is in the desired position on the support.

1 7. The positioning device of claim 1, wherein one or more of the alignment
2 members comprises a curved surface that contacts the inner wall of the microtiter plate.

1 8. The positioning device of claim 7, wherein one or more of the alignment
2 members comprises a locating pin.

1 **9.** The positioning device of claim 1, which further comprises a pusher that
2 can move a microtiter plate in a first direction to bring a first inner wall of the microtiter
3 plate into contact with one or more of the alignment members.

1 **10.** The positioning device of claim 9, wherein the positioning device
2 comprises a second pusher that can move the microtiter plate in a second direction to bring a
3 second inner wall of the microtiter plate into contact with one or more of the alignment
4 members.

1 **11.** The positioning device of claim 10, wherein the device comprises two
2 alignment members that are in contact with the first inner wall of a microtiter plate when the
3 microtiter plate is in a desired position.

1 **12.** The positioning device of claim 1, wherein the positioning device
2 comprises a retaining device which retains the microtiter plate in the desired position on the
3 support.

1 **13.** The positioning device of claim 12, wherein the retaining device
2 comprises a vacuum plate.

1 **14.** A retaining device for retaining a microtiter plate in a desired position
2 on a support, wherein the retaining device comprises a vacuum plate which, when a vacuum
3 is applied, holds the microtiter plate in the desired position.

1 **15.** The retaining device of claim 14, wherein the vacuum plate is connected
2 to a vacuum source.

1 **16.** The retaining device of claim 14, wherein the vacuum plate comprises
2 an interior surface and a lip surface, with the interior surface being recessed relative to the
3 lip surface.

1 **17.** The retaining device of claim 16, wherein the depth at which the interior
2 surface is recessed is between 0.001 inches and 0.01 inches.

1 **18.** The retaining device of claim 16, wherein a support matrix
2 approximately as thick as the depth at which the interior surface is recessed is present on the
3 interior surface to prevent distortion of the microtiter plate when a vacuum is applied.

1 **19.** The retaining device of claim 14, wherein the device comprises a
2 vacuum-actuated switch that, when the microtiter plate forms an airtight seal with the
3 vacuum plate, generates a signal that the microtiter plate is properly positioned.

1 **20.** The retaining device of claim 19, wherein the signal notifies a controller
2 that the microtiter plate is ready for further processing.

1 **21.** An object holder for precisely positioning an object on a support,
2 wherein the object holder comprises:
3 a first pusher for moving the object in a first direction so that a first
4 alignment surface of the object contacts a first set of one or more alignment members; and
5 a second pusher for moving the object in a second direction so that a
6 second alignment surface of the object contacts a second set of one or more alignment
7 members; wherein
8 wherein the first pusher comprises a lever pivoting about a pivot point.

1 **22.** The object holder of claim 21, wherein the lever is operably attached to
2 a spring which causes the pusher to apply a constant force to the object in order to move the
3 object in the first direction against the first set of alignment members.

1 **23.** The object holder of claim 21, wherein the first pusher comprises a low
2 friction contact point which contacts the object, thus facilitating movement of the object in
3 the second direction by the second pusher.

1 **24.** The object holder of claim 23, wherein the low friction contact point is a
2 roller.

1 **25.** The object holder of claim 21, wherein the object is a microtiter plate.

1 **26.** The object holder of claim 25, wherein either or both of the first
2 alignment surface and the second alignment surface is an inner wall of the microtiter plate.

1 **27.** The object holder of claim 21, wherein the object holder comprises one
2 or more sensors that detect the position of one or more of the pushers, thereby determining
3 whether the object is in a desired position.

1 **28.** The object holder of claim 21, wherein the object holder comprises a
2 controller that first directs the first pusher to move the object in a first direction, then directs
3 the second pusher to move the object in a second direction, and subsequently directs a
4 retaining device to be activated.

1 **29.** An automated system for performing high-throughput assays or
2 reactions in microtiter plates, wherein the automated system comprises a positioning device
3 of claim 1.

1 **30.** The automated system of claim 29, wherein the automated system
2 comprises a robotic device for placing a microtiter plate on the positioning device.

1 **31.** The automated system of claim 29, wherein the automated system
2 comprises a liquid dispenser which can deposit reagents in wells of a microtiter plate.

1 **32.** An automated system for performing high-throughput assays or
2 reactions in microtiter plates, wherein the automated system comprises a retaining device of
3 claim 14.

1 **36.** The object holder according to claim 35, wherein the object is a
2 microtiter plate.

1 **37.** The object holder according to claim 36, wherein the retaining device is
2 a vacuum plate connected to a vacuum source.

1 **38.** The object holder according to claim 37, wherein the object is a
2 microtiter plate that has a well area, and the vacuum plate cooperates with a bottom of the
3 well area to securely hold the plate.

1 **39.** A method of receiving and retaining an object in a desired orientation,
2 the object having a first alignment surface and a second alignment surface, the method
3 comprising:

4 placing the first alignment surface of the object loosely adjacent a first
5 alignment member, and placing the second alignment surface of the object loosely adjacent a
6 second alignment member;

7 moving a first pusher against the object so that the first alignment
8 surface is held firmly against the first alignment member; and

9 moving a second pusher against the object so that the second alignment
10 surface is held firmly against the second alignment member.

1 **40.** The method of claim 39, wherein the method further comprises verifying
2 that either or both of the first pusher and the second pusher are properly positioned to hold
3 the object against the alignment members.

1 **41.** The method of claim 39, wherein the method further comprises
2 activating a retention device that holds the object in the desired orientation.

1 **42.** A software program which operates on a controller, wherein the
2 software directs the controller to implement the method of claim 39.